

Amendments to the Drawings:

FIG. 2 has been amended to correspond with the written description. Namely, item number 111 (Host I/F) has been changed to item number 2031 to correspond to the written description.

Attachment: One replacement drawing sheet illustrating FIG. 2.

REMARKS

Claims 12 and 26 have been amended to correct minor antecedence informalities and grammatical errors. Claims 1-11 and 15-25 were canceled without prejudice or disclaimer by prior amendment. New claims 29-42 have been added. Accordingly, claims 12-14 and 26-42 are now pending in this application.

Amendments to the Drawings

FIG. 2 has been amended to correct a typographical error.

35 U.S.C. §102

Claims 12-14 and 26-28 stand rejected under 35 U.S.C. §102(b) as being anticipated by Padovano (U.S. Pat. App. Pub. No. 20020156984). These rejections are traversed as follows.

Discussion of the Invention

The present invention provides a method and apparatus for virtualizing network storage while also permitting access to the network storage separately from a virtualization apparatus. In a network storage system having a plurality of network storage devices, an external device connected via a network is able to access the network storage devices as one virtual network storage system through the

virtualization apparatus. In addition, the external device is able to directly access the network storage devices separately from the virtualized network storage system for other (configuration) purposes, such as mirroring, reporting, verifying or backing up.

Discussion of Padova

The Office Action asserts that Padova teaches the pending claims. However, Padova is directed to a SAN for providing storage to hosts that includes a storage appliance that couples the SAN to the hosts via a first network. Padova also attaches the storage appliance to a second network, such that storage in the SAN may be accessed by hosts in the second network as one or more NAS devices. The first network may be a SCSI, Fibre Channel or similar network type, while the second network may be a local area network, wide area network, or other network type (see, e.g., par. [0043] of Padova).

Padova's SAN storage appliance provides data management capabilities for the attached SAN. Such data management capabilities may include data mirroring, point-in-time imaging (snapshot) of data, storage virtualization, and storage security. According to Padova, the SAN appliance also provides NAS capabilities, such as access to file systems stored in the SAN, over the second network (see, e.g., par. [0044]).

NAS functionality is provided by one or more NAS servers within the SAN appliance. The NAS servers are attached to the SAN servers. The SAN servers

communicate with the NAS servers using a protocol containing commands that the NAS servers understand. For instance, these commands may direct the NAS servers to allocate and deallocate storage from the SAN to and from the second network (see, e.g., par. [0045]).

The NAS servers appear as separate hosts to the SAN servers. The SAN servers allocate storage to the NAS servers. In turn, the NAS servers allocate the storage to the second network. For instance, storage may be allocated in the form of logical unit numbers (LUNs) to the NAS servers. According to Padovano, the NAS server LUNs are virtualized on the second network, instead of being dedicated to a single host. Thus, the SAN appliance can export LUNs to the entire second network (see, e.g., par. [0046]).

A user, such as a system administrator, can control NAS functions performed by the SAN appliance through an administrative interface, which includes a central graphical user interface (GUI). The GUI presents a single management console for controlling multiple NAS servers (see, e.g., par. [0047]).

The SAN appliance allows storage in the SAN to be accessed as one or more NAS devices. The SAN appliance creates local file systems, and then grants access to those file systems over the second network through standard protocols, such as Network File System (NFS) and Common Internet File System (CIFS) protocols. As such, Padovano's invention unifies local SAN management and provides file systems over the second network (see, e.g., par. [0048]).

Thus, from the foregoing, it is apparent that Padova teaches a SAN storage appliance 108, 210 that controls all access to storage devices 110-114. The storage appliance provides resource allocation to hosts and data management capabilities (see, e.g., par. [0072]), including storage virtualization/mapping, wherein all connected storage in the SAN is provided as a single pool of storage (see, e.g., par [0073]), and also including data mirroring (see, e.g., par [0074]). Thus, Padova does not teach a system or method by which a network storage device can be accessed separately from a virtualization device, such as for configuring access control, as recited in claims 12 and 26.

Padovano Does Not Teach Claims 12 or 26

The Office Action at page 3 asserts that FIG. 4, item 402, of Padova teaches a first network storage device and a second network storage device. The Office Action further asserts that item 412 of FIG. 4 is an external device able to access the network storage devices separately from the apparatus having the function of forming the network storage devices as one virtual network, as required by limitations of claims 12 and 26.

However, FIG. 4 actually teaches a SAN server 302 that is part of the SAN appliance 108, 210, as illustrated in FIGS. 3A-3B, and as discussed at paragraph [0120], first two lines, of Padova. Thus, since SAN server 302 is part of the SAN appliance, it should be apparent that administrative interface 412 accesses the

storage devices through the SAN appliance and not separately therefrom, as required by claims 12 and 26.

Furthermore, first network interface 406 and second network interface 402 are also part of SAN server 302. Thus, these are also part of the SAN storage appliance 210 that performs the virtualization function. Padovano fails to teach any arrangement whereby a network storage device may be accessed for configuring separately from the virtualization apparatus, as required by claims 12 and 26.

See, also, paragraph [0147], wherein it is clearly stated that, as “shown in FIG. 4, an administrative interface 412 is coupled to SAN storage manager 404 of SAN server 302. When present, the administrative interface couples to the primary SAN server in the storage appliance 210. The primary SAN server forwards directives to NAS servers.” (emphasis added) As established above, the SAN appliance performs the virtualization function for the SAN, and the SAN server 302 is part of the SAN appliance (see, e.g., par. [0090], par. [0092], and FIGS. 3A-3B).

Additionally, even when the NAS servers are visible to the administrative interface as NAS servers, as discussed at par. [0148], the NAS servers are still managed through the SAN server, as evidenced by par. [0149] which states:

In order to represent the NAS servers as NAS servers in the administrative interface, the administrative interface must be able to differentiate NAS servers from hosts. In an embodiment, the NAS servers issue a special registration command via second communications interface 116 to the SAN servers, to identify themselves. (emphasis added)

Furthermore, although the NAS server 304 illustrated in FIG. 5 was not cited in the Office Action, NAS server 304 includes a first network interface 508 and a second network interface 502. However, as recited in par. [0146]:

First network interface 508 also receives storage allocation and deallocation directives, and status directives from SAN server 302, and sends them to NAS file manager 512. Note that in embodiments, second network interface 502 may also or alternatively receive these storage allocation and deallocation directives. Responses to these received storage allocation and deallocation directives, and status directives are generated by NAS file manager 512. NAS file manager 512 sends these responses to first network interface 508, which outputs the responses onto second communication network 116 for SAN server 302. (emphasis added)

Thus, Padovano only teaches configuring the NAS servers through the SAN server 302. Nowhere in Padovano is there taught a computer able to access network storage devices for configuration or management of the storage devices without accessing the SAN server and the SAN appliance.

Accordingly, Padovano fails to teach a first patentable feature of the claimed invention. Namely, Padovano does not teach a first network storage device and second network storage device having interfaces (I/Fs) connected to an apparatus (virtualization apparatus) having a function of forming the network storage devices as one virtual network storage device, wherein the second network storage device also includes a host I/F which is connectable to an external device, so as to permit the external device to access the network storage devices separately from the virtualization apparatus . . . to enable configuring access control of a volume, as

recited in claims 12 and 26. In particular, all commands for configuring NAS servers are sent to the SAN server, and the SAN server generates messages to be sent to the NAS server (see, e.g., par. [0147]). See also, for example, par. [0162] of Padova, wherein the “storage allocator module 416 in SAN storage manager 404 of SAN server 302 generates messages corresponding to received storage management directives to be sent to NAS server 304.” Furthermore, see for example, par. [0187], wherein “When LUNs are being allocated by SAN server 302 to NAS server 304, SAN server 302 sends NAS servers 304a and 304b a packet containing the following string: LUN:Enable:LunNumber:CreateFsFlag.” Numerous other such examples exist in Padova, and at no point does Padova teach a network storage device having a host I/F to enable an external device to access network storage devices separately from a virtualization appliance for configuration of the network storage devices. This ability to access the network storage devices separately is an advantageous feature of the invention that maximizes the efficient usage of ports in storage systems that are required to be highly available at all times, and is not taught or suggested by Padova. Accordingly, this feature of claims 12 and 26 is patentable over Padova and the other art of record.

Furthermore, Padova does not teach the remaining limitations of claims 12 and 26 either. In particular, Padova does not teach configuring access control of said secondary volume from outside of said apparatus having a function of forming said network storage devices as one virtual network storage device, wherein said

configuring step comprises the steps of: creating a mirroring pair between said primary volume and said secondary volume at a certain point in time by taking a complete initial copy of said primary volume and storing said complete initial copy in said secondary volume; receiving in said second storage device a suspend request; placing the mirroring pair into a suspend status to permit setting of the access control according to user selection; if the user chooses a read only mode, setting said secondary volume to the read only mode for input/output (I/O) requests from said external device and re-synchronizing the mirroring pair; and if the user chooses a read/write mode, setting said secondary volume to the read/write mode for input/output (I/O) requests from said external device and re-synchronizing the mirroring pair.

The Office Action asserts that configuring access control of the secondary volume from outside the apparatus is taught by Padovano's SAN server 302 and administrative interface at par. [0105]-[0107]. However, as pointed out above, the SAN server 302 is the virtualization apparatus, and therefore, if the SAN server is being used for the configuring of access control, this cannot be performed "outside of said apparatus" as required by claims 12 and 26. Further, Padovano shows a security in SAN server 302, Padovano does not teach any specific methods of configuring access control, and does not teach the method recited in claims 12 and 26.

Additionally, with regards to creating a mirroring pair between the primary volume and the secondary volume . . . , again, this is carried out by the SAN server (see, e.g., par. [0126]) and not by an external device accessing the second network storage system separately. The remaining limitations are similarly not taught or suggested by Padovano. Accordingly, claims 12 and 26 are additionally patentable over Padovano for these features.

Discussion of New Claim 29

New claim 29 includes limitations similar to those discussed above with respect to claims 12 and 26, and is patentable for the same reasons. Namely, Padovano and the other art of record fail to teach a virtualization apparatus that is connected to be able to communicate with a first network storage device via a first interface and a second network storage device via a second interface, and that allows a client connected via a network to access the first and second network storage devices as one virtual network storage system, wherein a computer is able to access the network storage devices separately from the virtualization apparatus via a third I/F included in one of the first network storage device or the second network storage device for configuring the network storage devices. Padovano only teaches configuring the NAS servers through the SAN appliance, and accordingly, claim 29 is allowable.

The remaining claims claim additional patentable features of the invention, and are allowable at least because they depend from allowable base claims.

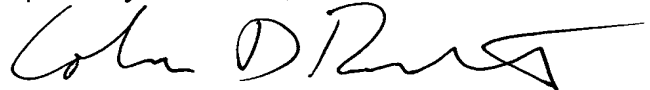
Request for Interview

After reviewing Padovano in light of the above remarks, should the Examiner continue to be of the opinion that Padovano teaches the claimed invention, Applicant's undersigned attorney respectfully requests that the Examiner contact him so that an interview may be scheduled prior to the issuance of the next Office Action so that and discrepancies in interpretation of Padovano may be resolved more efficiently to better expedite prosecution of this application.

Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully request that a timely Notice of Allowance be issued in this case.

Respectfully submitted,



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